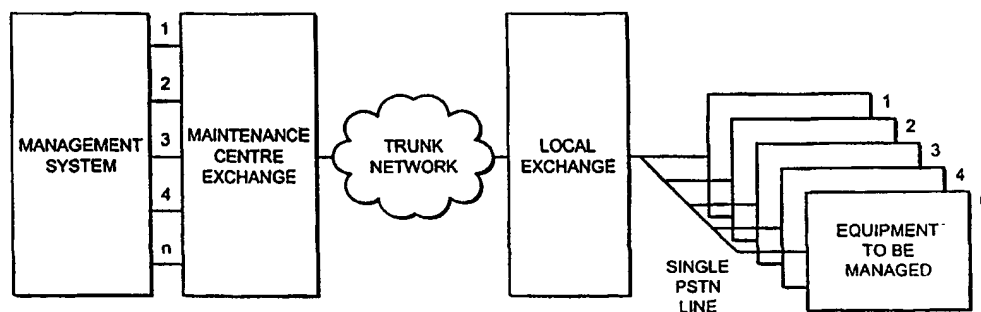




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: REMOTE MANAGEMENT SYSTEM FOR ELECTRONIC EQUIPMENT



## (57) Abstract

The remote management of a group of items of equipment placed at a given location and served by a single telephone line is initiated by dialling the single telephone line from a telephone subscriber number a digit or digits of which provide an identification address of one selected item of equipment within the group. Each item of equipment within the group has a unique identification address and is adapted to answer a telephone call on the single telephone line only when presented with a calling line identity of which a digit or digits provide the unique identification address for that item of equipment. Thus, a management system can selectively interrogate individual items of equipment connected to a single telephone line, simply by providing for the presentation on the single telephone line of a calling line identity which has relevant digits coinciding with the unique address of the item of equipment being interrogated.

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### Remote Management System for Electronic Equipment

This invention concerns an improved method and means for the remote management of electronic equipment. In a preferred embodiment the invention relates to the management of telephone exchange equipment associated with subscriber telephone lines, but in principle the invention is applicable to the remote management of any installation comprising a group of items of electronic equipment placed together at a given location that is capable of being served by a telephone line.

In the management of telephone exchange line equipment it is necessary that the status of exchange line equipment be monitored in order that faults arising can be detected promptly and reported in a manner that enables the fault to be located and remedied as quickly as possible. In conventional public telephone exchange networks such fault location and reporting is achieved by a monitoring system that is overlaid upon the telephone communication network and is therefore distinct from the network of subscriber lines, for example in the form of a separate X25 data network. However the present invention stems from the appreciation that in some contexts a management system may be required that makes use of the telephone network itself as a medium for the monitoring of equipment. This would for example enable the motoring of equipment, such as a PABX network, coupled to but distinct from the public telephone exchange, or even the monitoring of groups of domestic electronic equipment located at premises served by a telephone line. Nevertheless such a system would also be applicable within a public exchange network in addition to or in place of an overlaid data network.

The invention accordingly provides a method for the remote management of an installation comprising a group of items of equipment placed at a given location served by a single telephone line of a telephone exchange network of the kind providing calling line identification, each of said items of equipment having the capability of reporting its status by answering an incoming call on a telephone line and returning data providing a status report, wherein said plurality of items of equipment are connected in common to said single telephone line, each item of equipment is provided with a numeric identification address unique to said group and is further adapted to answer a telephone call on said single telephone line only when presented with a calling line identity of which a digit or digits of a given rank coincide with its unique identification address, and said items of equipment are selectively interrogated, remotely, by

causing a management system to initiate a telephone call to said single telephone line from a telephone subscriber number of which a digit or digits of said given rank provide the identification address of a selected item of equipment within said group.

The method of the invention has the advantage that individual items of electronic equipment can selectively be monitored by a management system via a telephone exchange network simply by initiating a telephone call through the network from a calling line having a subscriber number appropriate to the particular item of equipment to be monitored. This may require that the management system have access to multiple telephone lines with corresponding identities, although facilities are now available, for example using ISDN, whereby multiple subscriber numbers can be allocated to a single calling line.

Advantageously, each item of said group is provided, upon installation, with a pre-programmed telephone subscriber number corresponding to a telephone line serving said management system, and is caused to derive its own unique identification address from said management system by initiating a telephone call to said pre-programmed subscriber number.

This enables an installation to be set up in a simple manner, without the need for an installer to have access to a database defining the calling line identities to which the individual items of equipment are to respond.

According to a preferred embodiment of the invention, each item of said group comprises equipment associated with one or more corresponding telephone subscriber lines other than said single line and is arranged to provide the calling line identity of a said corresponding telephone subscriber line in conjunction with said status report. Each said item may then be arranged to derive the calling line identity of a said corresponding subscriber line by initiating a telephone call from said corresponding subscriber line to said single telephone line and recording the corresponding calling line identity presented on said single telephone line upon receipt of the incoming call. This enables telephone exchange equipment to be monitored in a simple manner.

Further preferred features and advantages of the invention will become apparent from the following description and the appended claims.

The invention is illustrated by way of example in the accompanying drawings, in which:

Figure 1 is a diagrammatic view of a telephone exchange system coupled to a management system embodying the method of the invention, and

Figure 2 is a further diagram illustrating a portion of the system of Figure 1, in more detail.

Referring to Fig. 1 the diagram shows five items of equipment, however the system is scaleable to almost any number. Each one of these contains a management system that can be accessed via a single PSTN port. All of the ports are paralleled and taken to a single port on the local exchange. It is not necessary that the equipment is mounted in the local exchange. It could be connected to any part of the access network.

The local exchange is then connected over the trunk network to another exchange in the normal way. In practice this is just another local exchange, however one PSTN line is connected to the management system for each item of equipment that is connected to the single PSTN line in the first local exchange. It should be noted that there can be multiple remote sites all served from one central management system. In this case the number of lines required by the central management system is just the maximum number of items of equipment located at any one of the sites. Alternatively, the management system may be interfaced to the network using a single ISDN line. Multiple subscriber numbers (MSN) can then be used to generate a calling line identification code having, for example, the last two or three digits programmable as required to address the specific item or group of equipment to be managed. Each item or group of such equipment may be programmed upon installation with a sequential number say from 001 to 999. To access, for example, shelf four in a particular exchange, the central management system could simulate a call having a calling line identification (CLI) ending in 004. Only shelf four would respond to an incoming call from the central management system with this CLI ending. It is not necessary that the management system is physically mounted in the exchange building. It can be connected to any part of the access network.

On installation of the remote equipment each item may first be logged with the central management system. It does this by dialling a pre programmed number corresponding to one of

the lines serving the management system. The management system then looks at the calling line identity signal and determines the local exchange location. It then passes onto the remote equipment a number corresponding to one of the lines used to serve it by the maintenance centre exchange. This will be used to address the equipment in the future. The remote equipment may display this number for ease of reference.

If the management system wishes to interrogate one of the remote items it just dials on the corresponding line the number of the local exchange where the equipment is connected. On detection of the calling line identity signal the corresponding remote equipment answers the call. An exchange of information can then take place using any convenient modem standard.

The reverse direction can also take place. Any piece of remote equipment can dial the management system directly using the pre programmed telephone subscriber number corresponding to a telephone line serving the management system. On connection the remote equipment, using any convenient modem standard, passes over its reference which when added to the calling line identity presented to the management system gives a unique reference to the remote equipment. Once this is complete there can then be an exchange of information in the same way as for the case where the management system dials into the remote equipment.

#### **Automatic Determination of Customer Number**

It is common practice in telephone companies to reference faults by using the customer directory number. It is a great advantage for any management system to report line status with respect to the customer number rather than some abstract equipment reference. The following system allows this to be done using simple components and standard exchange interfaces.

Figure 2 shows the local exchange with two items of equipment, which in this case are access network systems, installed. The single PSTN maintenance connections links the two systems to the exchange. For simplicity only the top system shows the customer line connections to the exchange and access network.

When the systems are installed they are logged onto the central management system as described above. A reference number is allocated to each system as before, however the directory number of the maintenance line connection is also passed over from the management system. Both these

number are stored locally as shown.

When the maintenance line connection is otherwise not in use for reporting on the serviceability of the systems, one of the pieces of equipment to be managed dials the directory number of the maintenance line into the local exchange from one of the customer line connections to which it is connected via the access system. The corresponding calling line identity signal will then be presented on the maintenance line. As this will not be one of the reference numbers to which these equipments respond none of the pieces of equipment will answer the call, however the item that generated the call will know that the calling line identity corresponds to the directory number of the customer line connection used. This information is then stored in the database, so producing a table indexing the assignment of the equipment to be managed to the customer number served by such equipment.

Each item of equipment may serve a number of customer lines, as illustrated, and, in this case, it works through all the line connections until a complete database is produced cross referencing the customer numbers to the physical circuit positions. This information can then be used to reference all serviceability information to the specific customer directory numbers served by that item of equipment. Any faults or service impairments detected by the equipment may therefore be reported directly with reference to the customer or customers affected, so facilitating repair or rectification. Any unutilised capacity in the access network equipment installed can also be readily detected and reported, enabling such equipment to be re-deployed as desired.

Due to general maintenance that occurs within an exchange the customer number connected to an individual item of access network equipment can change after initial installation. The system can easily cater for this situation by periodically determining the customer number assignment from time to time.

**Claims**

1. A method for the remote management of an installation comprising a group of items of equipment placed at a given location served by a single telephone line of a telephone exchange network of the kind providing calling line identification, each of said items of equipment having the capability of reporting its status by answering an incoming call on telephone line and returning data providing a status report, wherein said plurality of items of equipment are connected in common to said single telephone line, each item of equipment is provided with a numeric identification address unique to said group and is further adapted to answer a telephone call on said single telephone line only when presented with a calling line identity of which a digit or digits of a given rank coincide with its unique identification address, and said items of equipment are selectively interrogated, remotely, by causing a management system to initiate a telephone call to said single telephone line from a telephone subscriber number of which a digit or digits of said given rank provide the identification address of a selected item of equipment within said group.
2. A method according to Claim 1, wherein each item of said group is provided, upon installation, with a pre-programmed telephone subscriber number corresponding to a telephone line serving said management system, and is caused to derive its own unique identification address from said management system by initiating a telephone call to said pre-programmed subscriber number.
3. A method according to Claim 1 or 2, wherein each item of said group comprises equipment associated with one or more corresponding telephone subscriber lines other than said single line and is arranged to provide the calling line identity of a said corresponding telephone subscriber line in conjunction with said status report.
4. A method according to Claim 3, wherein each said item, is arranged to derive the calling line identity of a said corresponding subscriber line by initiating a telephone call from said corresponding subscriber line to said single telephone line and recording the corresponding calling line identity presented on said single telephone line upon receipt of the incoming call.
5. A method according to any one of Claims 1 to 4, wherein said digit or digits of said given rank comprise the last digit or the last several digits of said calling line identity.



6. An equipment installation comprising a group of items of equipment arranged for connection in common to a single subscriber telephone line, each item of equipment being adapted to respond to an incoming call on said single line only upon condition that a given digit or digits of a calling line identity presented on said line correspond to a numeric address unique to that item of the group.

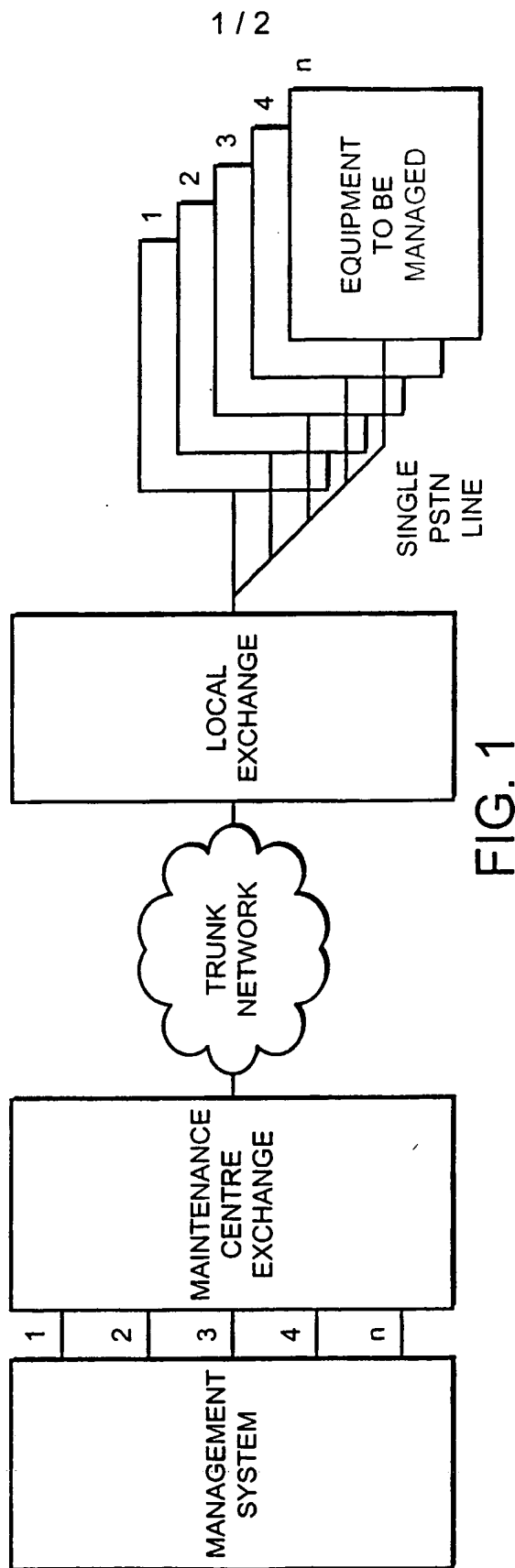
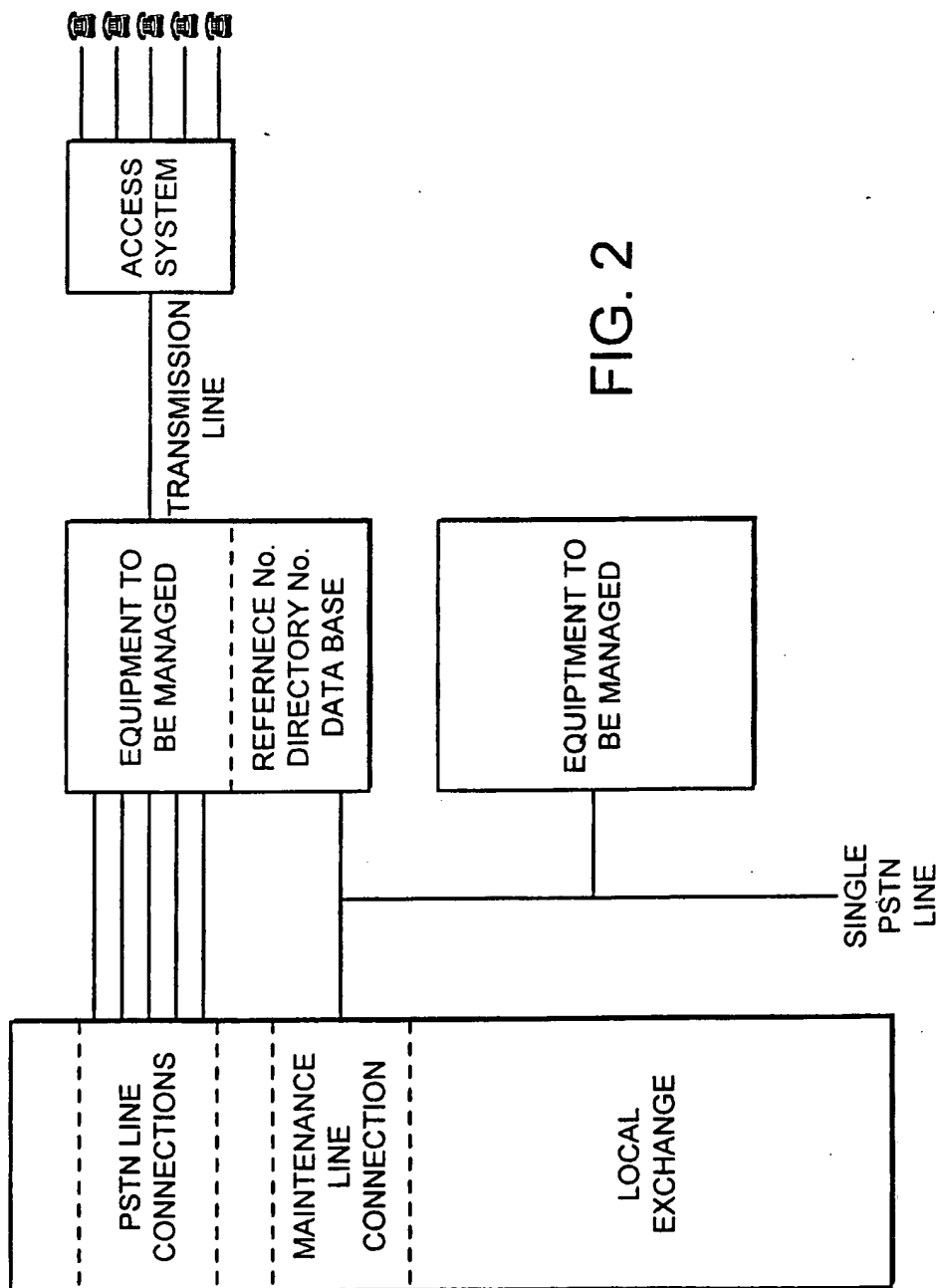


FIG. 1

2 / 2



# INTERNATIONAL SEARCH REPORT

Inter. nat. Application No

PCT/GB 99/04113

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 H04M11/00 H04Q11/04

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04M H04Q H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 845 896 A (NORTHERN TELECOM LTD) 3 June 1998 (1998-06-03) column 1, line 12 - line 24 column 3, line 13 - line 31 column 4, line 12 - line 15 column 6, line 23 - line 31 column 7, line 20 - line 28 column 9, line 51 - line 58 column 7, line 28 - line 34	1,6
A		2
Y	US 5 655 011 A (BROWN EDWIN ZANE) 5 August 1997 (1997-08-05) column 1, line 25 - line 33 column 1, line 47 - line 51 column 2, line 14 - line 18 column 3, line 9 - column 4, line 34	1,6
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☒ Further documents are listed in the continuation of box C.

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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